# Newtown Creek Superfund Site
## Surface Sediment - Background Threshold Value Discussion
## August 15, 2017

# Presentation Overview

- Purpose: To promote discussion of background threshold values (BTV) for surface sediment

- Definitions – EPA Guidance

- Background/reference area data collected

- Process to evaluate BTVs

- Potential BTV values

- Discussion of BTVs

# Background Definition

- Background
  - Substances or locations that are not influenced by the releases from a site and are usually described as naturally occurring or anthropogenic: (1) Naturally occurring substances present in the environment in forms that have not been influenced by human activity. (2) Anthropogenic substances are natural and human-made substances present in the environment as a result of human activities (not specifically related to the CERCLA site in question).

    Source: Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites, EPA 540-R-01-003, Sept. 2002.

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# Background Sampling Locations
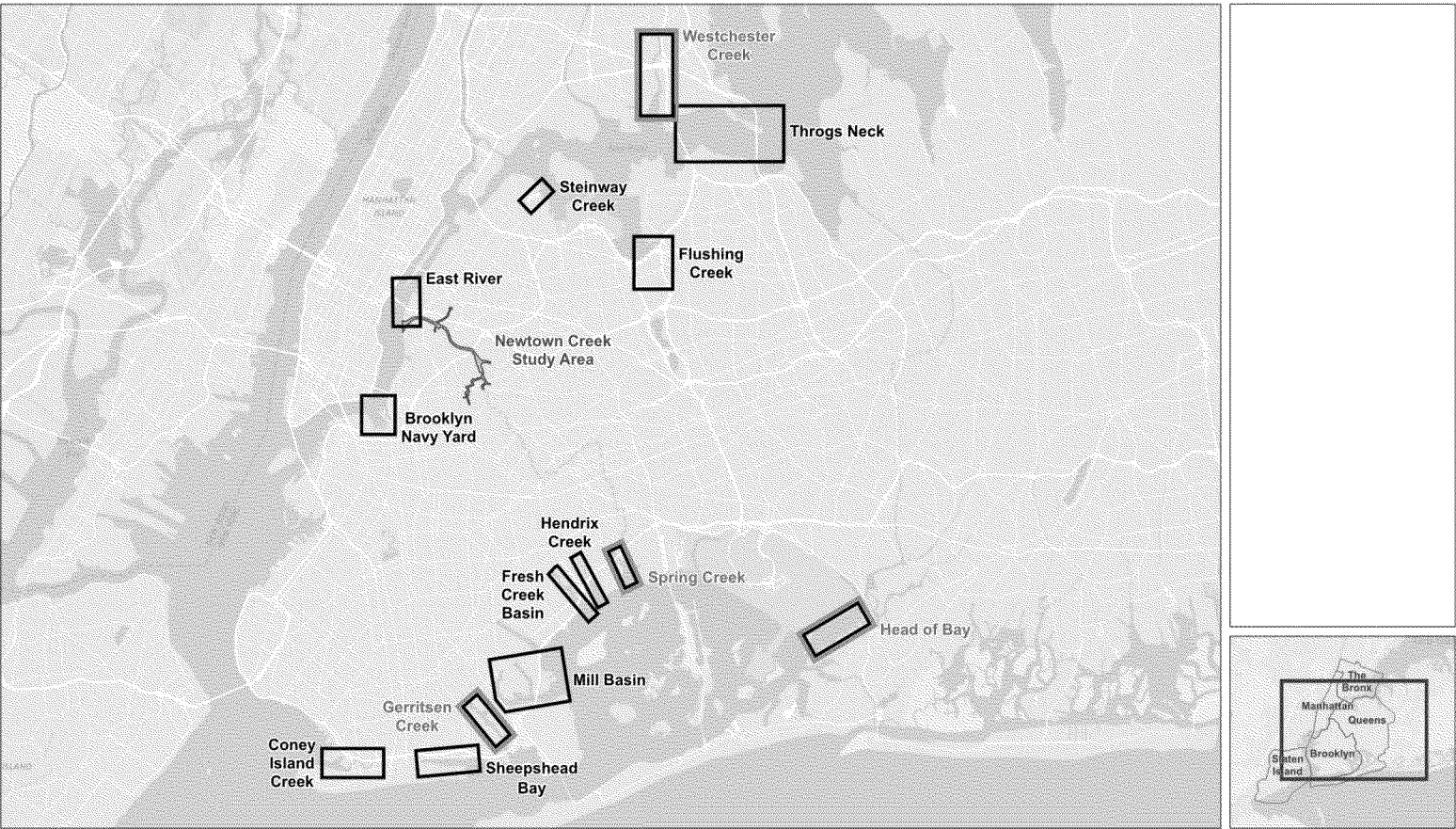


Blue outline – Selected Reference area for BERA     Source: Newtown Creek Draft RI Report, Anchor QEA.

# Background Data Evaluated

- Phase 1 and Phase 2 surface sediment data

- Analytes – total PCBs (combined Aroclor and congeners), total PAHs (17), and copper

- Background area categories established during the RI

  - CSO/Industrial            - CSO/Non-industrial

  - Non-CSO/ Industrial       - Non-CSO/Non-industrial

- Also evaluated East River background locations

  - East River (upper and lower)  - East River (all East River)

# Background Sample Summary

| Category | Count | Group | Count |
|---|---|---|---|
| CSO/Industrial | 40 | Brooklyn Navy Yard | 8 |
| | | Coney Island Creek | 8 |
| | | Flushing Creek | 6 |
| | | Westchester Creek | 18 |
| CSO/Non-Industrial | 31 | Fresh Creek Basin | 7 |
| | | Spring Creek | 18 |
| | | Upper East River – Throgs Neck | 6 |
| Non-CSO/Industrial | 39 | Head of Bay | 18 |
| | | Lower East River – Newtown Creek | 6 |
| | | Mill Basin | 8 |
| | | Steinway Creek | 7 |
| Non-CSO/Non-Industrial | 33 | Gerritsen Creek | 18 |
| | | Hendrix Creek | 7 |
| | | Sheepshead Bay | 8 |

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# Background Sample Summary – East River

| Category | Count | Group | Count |
|---|---|---|---|
| East River Locations | 51 | Brooklyn Navy Yard | 8 |
| | | Flushing Creek | 6 |
| | | Westchester Creek | 18 |
| | | Upper East River – Throgs Neck | 6 |
| | | Lower East River – Newtown Creek | 6 |
| | | Steinway Creek | 7 |
| East River (Lower and Upper) | 12 | Upper East River – Throgs Neck | 6 |
| | | Lower East River – Newtown Creek | 6 |
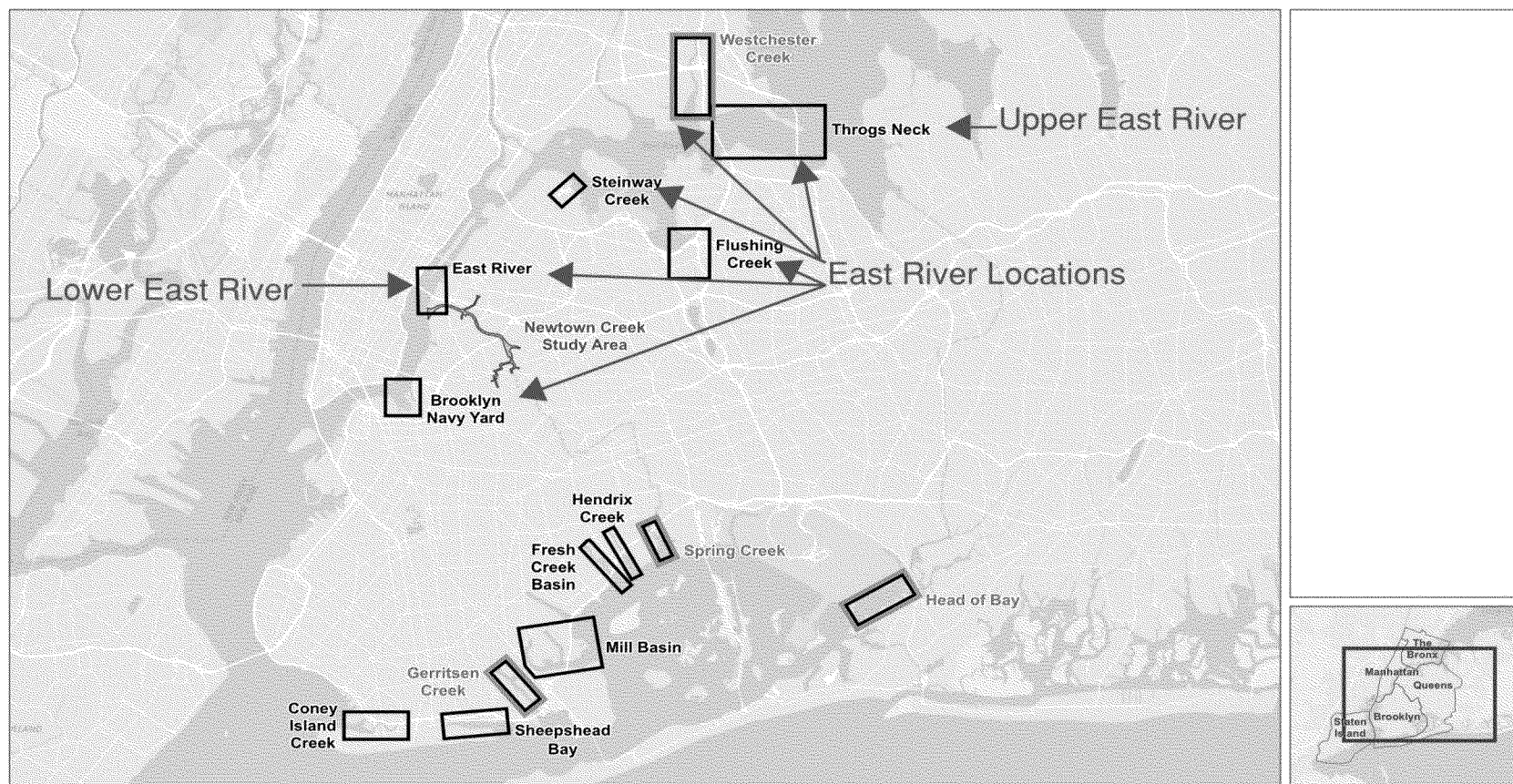
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# East River Locations



Blue outline – Selected Reference area for BERA     Source: Newtown Creek Draft RI Report, Anchor QEA.
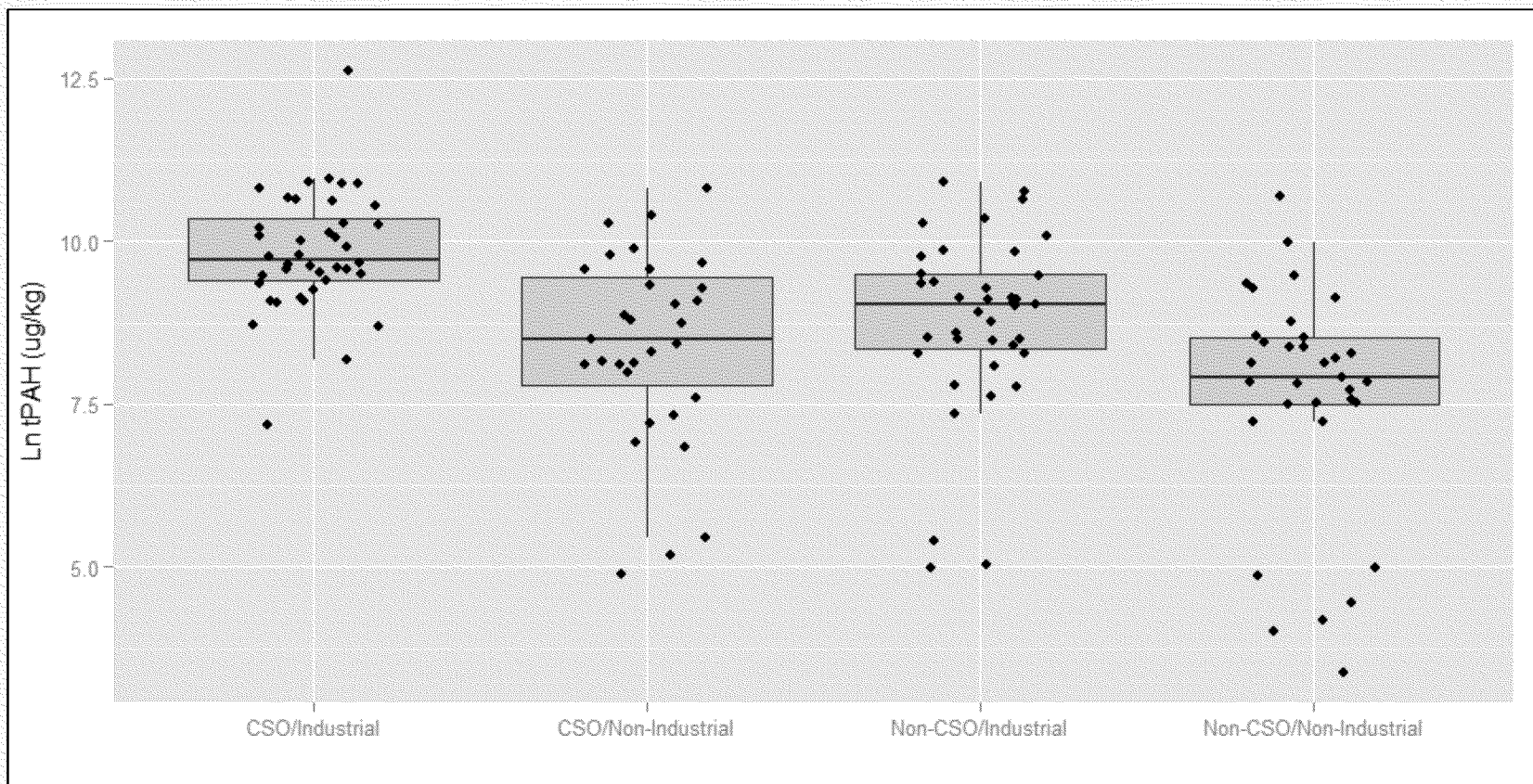
# Background Data Evaluation Process

- Used Pro-UCL and R programs for statistical analysis

- Distributional analysis

- Outlier testing and removal of outliers

- Determine data distribution

- Comparison testing of data categories (e.g., CSO/Industrial vs. CSO non-industrial) for each analyte group (tPCBs, tPAHs, and copper)

- BTV calculation
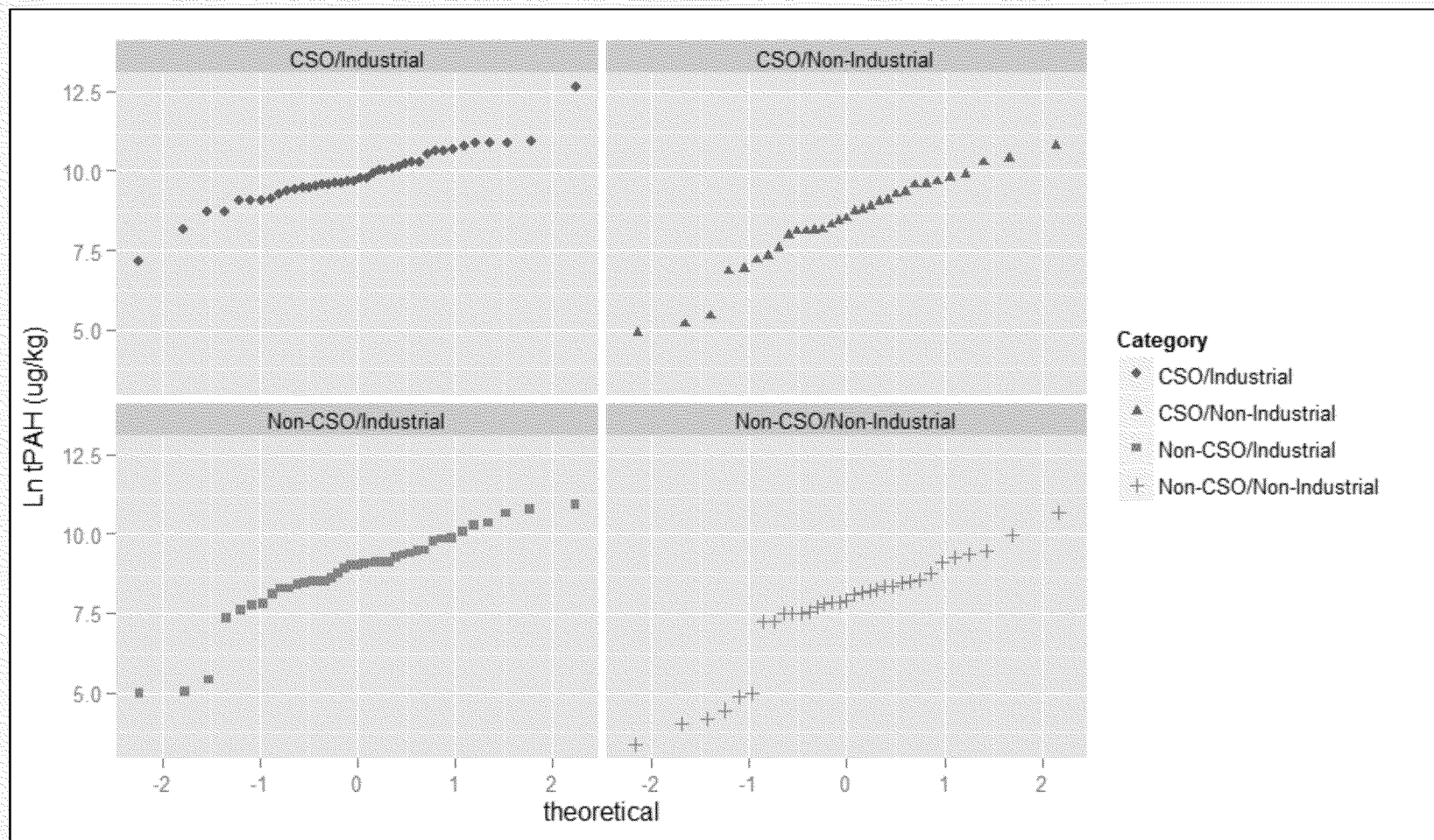
- Evaluation of BTV values

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# Box Plots - tPAH

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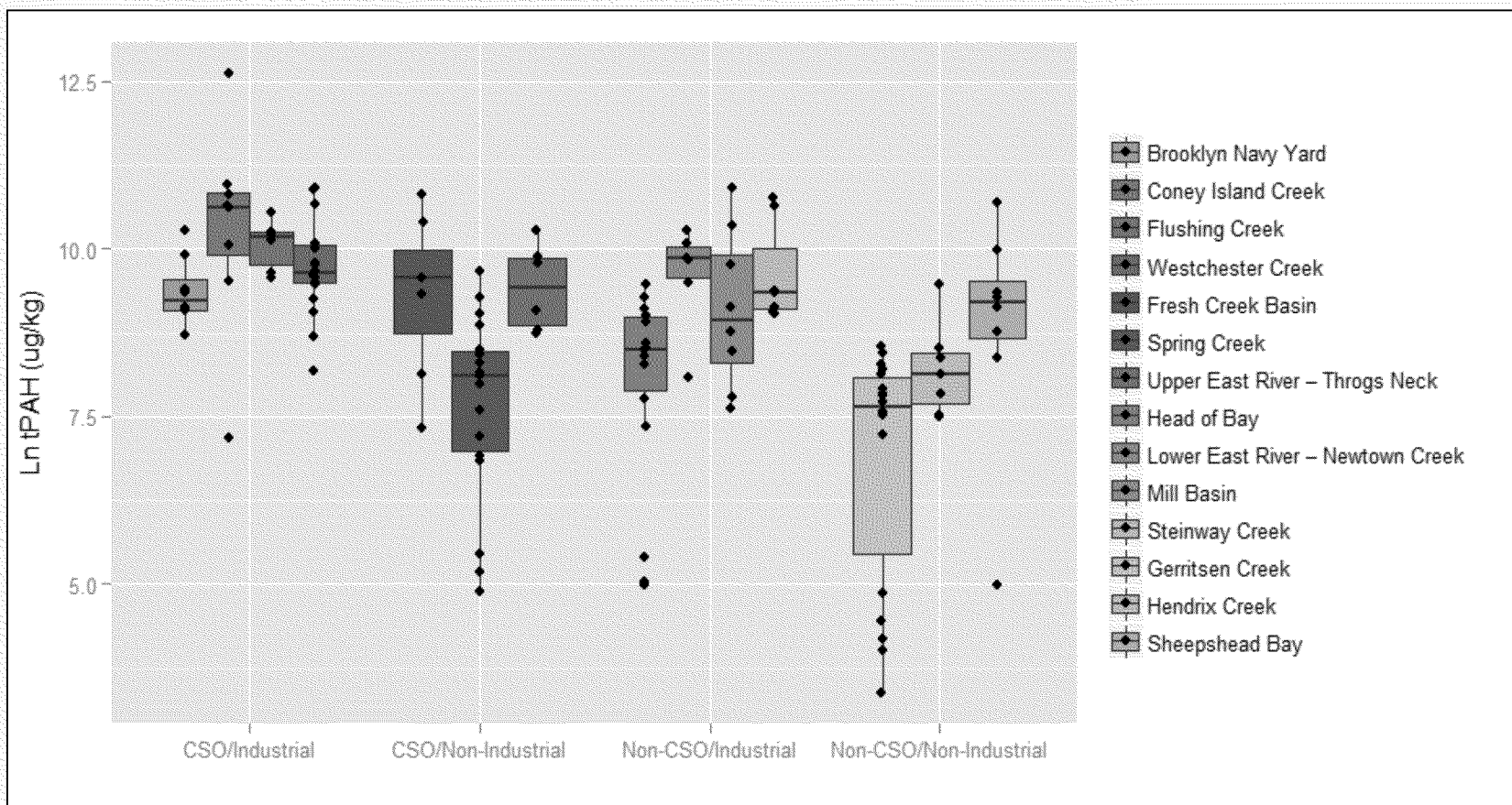
# Q-Q Plots - tPAH

# Outlier Testing

- Rosner method on log-transformed data
- Outliers identified
  - 10 tPAH
  - 6 tPCB
  - 10 copper
- Outliers represented the lowest concentrations in the four groups (one exception for tPAH)
- Outliers not identified in East River groupings
- Following outlier removal, all data groups passed the Shapiro-Wilk and Lilliefors test for normality on log-transformed data (p-values >0.05)

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# Q-Q plot - tPAH
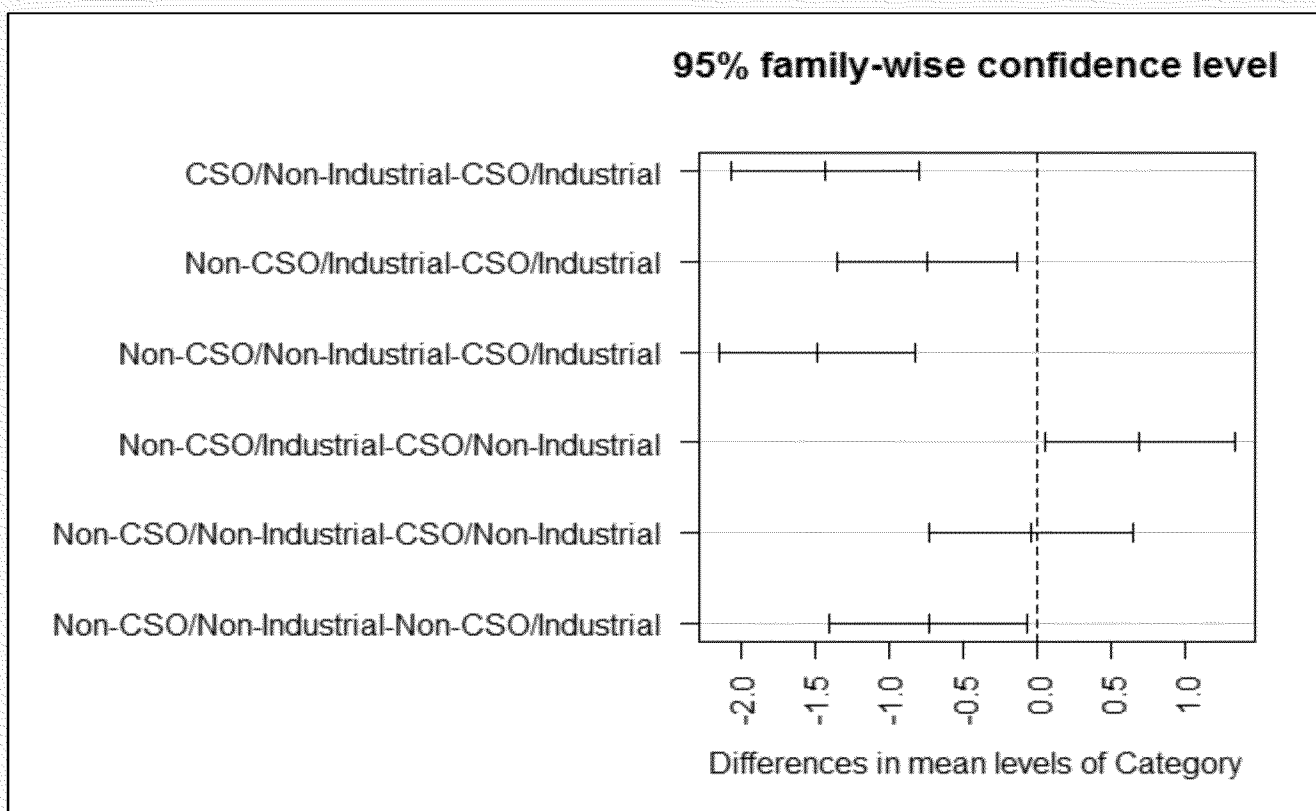


Lognormal Q-Q Plot for tPAH
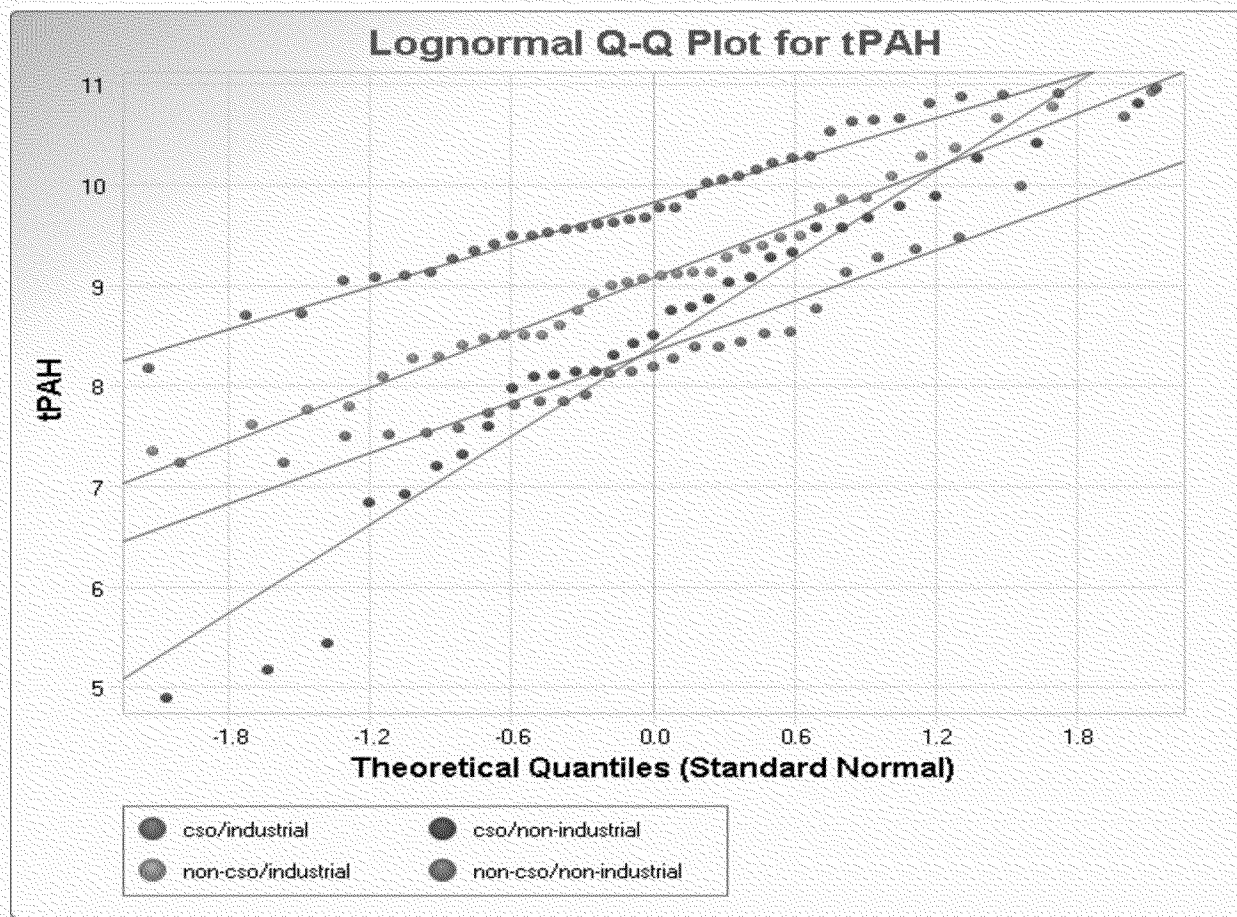
# Comparison Testing

- Data groups compared to determine statistical differences (i.e., are data from the same populations).

- Can data groups be combined

- Tested using ANOVA and Tukey HSD

- In general, groups should not be combined.

# Example Comparison Test- tPAH

# BTV Calculations

- Several methods available to calculate BTVs
- Upper Tolerance Level (UTL 95/95) –
- Upper Prediction Limit (UPL) 95% confidence
- USL – Upper Simultaneous Limit (USL)
- Maximum Values provided for comparison

# Potential BTVs – tPAH, tPCB, Cu

| Category | Limit | $k$ | Copper mg/kg | tPAH ug/kg | tPCB ug/kg |
|---|---|---|---|---|---|
| CSO/Industrial | Max Value | | 449 | 57,055 | 875 |
| | UTL 95 | | 446 | 80,814 | 1257 |
| | UPL | 1 | 363 | 60,334 | 986 |
| | USL | $\leq$20 | 641 | 132,380 | 1956 |
| CSO/Non-Industrial | Max Value | | 459 | 49,190 | 6265 |
| | UTL 95 | | 619 | 110,587 | 5161 |
| | UPL | 1 | 370 | 55,273 | 2330 |
| | USL | $\leq$20 | 1144 | 252,419 | 13,298 |
| Non-CSO/Industrial | Max Value | | 314 | 55,075 | 1768 |
| | UTL 95 | | 389 | 60,016 | 1267 |
| | UPL | 1 | 292 | 40,636 | 842 |
| | USL | $\leq$20 | 594 | 109,870 | 2457 |
| Non-CSO/Non-Industrial | Max Value | | 445 | 43,475 | 1645 |
| | UTL 95 | | 444 | 28,764 | 1439 |
| | UPL | 1 | 317 | 18,433 | 939 |
| | USL | $\leq$20 | 605 | 41,754 | 2199 |

# Potential BTVs - East River

| Category | Limit [1] | k | Copper mg/kg | tPAH ug/kg | tPCB ug/kg |
|---|---|---|---|---|---|
| East River Locations | Max Value | | 314 | 54,290 | 1768 |
| | UTL 95 | | 439 | 62,134 | 1573 |
| | UPL | 1 | 340 | 48,714 | 1154 |
| | USL | ≤20 | 839 | 114,729 | 3435 |
| East River (Lower and Upper) | Max Value | | 122 | 28,939 | 378 |
| | UTL 95 | | 228 | 90,084 | 912 |
| | UPL | 1 | 134 | 49,445 | 452 |
| | USL | ≤20 | 173 | 65,929 | 633 |

# Background Selection

- Some Considerations:
  - Newtown Creek is CSO/Industrial and is anticipated to continue to have industrial uses and CSO (although much reduced based on the LTCP).
  - Currently, a BTV based on the CSO/Industrial category data may be appropriate
  - As a future goal, with limited CSO, a BTV based on the Non-CSO/Industrial category data may be appropriate
  - Other factors to consider:
    - Risk Assessment Results
    - Risk Management
  - EPA is preparing a tech memo that will provide more detail on the evaluation of background data

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# Discussion/Questions